

WHAT IS CLAIMED IS:

1 1. A lithium secondary battery comprising a positive
2 electrode which is capable of occluding and releasing lithium, a
3 negative electrode which is capable of occluding and releasing
4 lithium, a separator between the positive electrode and the
5 negative electrode, and a nonaqueous electrolyte comprising a
6 nonaqueous solvent and a wettability improving agent,

7 wherein the nonaqueous solvent does not have substantial
8 wettability to the separator,

9 the wettability improving agent is dissolved in the nonaqueous
10 solvent, improves wettability of the nonaqueous solvent to the
11 separator, and has an oxidative decomposition potential in a range
12 of 4.5 V to 6.2 V based on the potential of a lithium reference
13 electrode.

1 2. The lithium secondary battery according to claim 1,
2 wherein the oxidative decomposition potential of the wettability
3 improving agent is smaller than that of the nonaqueous solvent.

1 3. The lithium secondary battery according to claim 1,
2 wherein a reductive decomposition potential of the wettability

3 improving agent is not greater than 0.0 V.

1 4. The lithium secondary battery according to claim 2,
2 wherein a reductive decomposition potential of the wettability
3 improving agent is not greater than 0.0 V.

1 5. The lithium secondary battery according to claim 1,
2 wherein a mass ratio of the wettability improving agent relative to
3 the nonaqueous solvent is not greater than 3 mass %.

1 6. The lithium secondary battery according to claim 2,
2 wherein a mass ratio of the wettability improving agent relative to
3 the nonaqueous solvent is not greater than 3 mass %.

1 7. The lithium secondary battery according to claim 3,
2 wherein a mass ratio of the wettability improving agent relative to
3 the nonaqueous solvent is not greater than 3 mass %.

1 8. The lithium secondary battery according to claim 4,
2 wherein a mass ratio of the wettability improving agent relative to
3 the nonaqueous solvent is not greater than 3 mass %.

1 9. The lithium secondary battery according to claim 1,
2 wherein the oxidative decomposition potential of the wettability
3 improving agent is in a range of 4.8 V to 5.2 V.

1 10. The lithium secondary battery according to claim 2,
2 wherein the oxidative decomposition potential of the wettability
3 improving agent is in a range of 4.8 V to 5.2 V.

1 11. The lithium secondary battery according to claim 3,
2 wherein the oxidative decomposition potential of the wettability
3 improving agent is in a range of 4.8 V to 5.2 V.

1 12. The lithium secondary battery according to claim 4,
2 wherein the oxidative decomposition potential of the wettability
3 improving agent is in a range of 4.8 V to 5.2 V.

1 13. The lithium secondary battery according to claim 5,
2 wherein the oxidative decomposition potential of the wettability
3 improving agent is in a range of 4.8 V to 5.2 V.

1 14. The lithium secondary battery according to claim 6,
2 wherein the oxidative decomposition potential of the wettability

3 improving agent is in a range of 4.8 V to 5.2 V.

1 15. The lithium secondary battery according to claim 7,
2 wherein the oxidative decomposition potential of the wettability
3 improving agent is in a range of 4.8 V to 5.2 V.

1 16. The lithium secondary battery according to claim 8,
2 wherein the oxidative decomposition potential of the wettability
3 improving agent is in a range of 4.8 V to 5.2 V.

1 17. The lithium secondary battery according to claim 1,
2 wherein the separator comprises polyethylene, the electrolyte
3 comprises a mixture of ethylene carbonate and γ -butyrolactone and
4 the wettability improving agent is selected from the group
5 consisting of 1,2-dimethoxyethane (DME), tetrahydrofuran (THF), 2-
6 methyltetrahydrofuran (2-MeTHF), 1,3-dioxolane (DOL), 4-methyl-1,3-
7 dioxolane (4-MeDOL), N,N-dimethylformamide (DMF), N-
8 methylpyrrolidone (NMP), methyl formate (MF) and dimethyl sulfoxide
9 (DMSO).